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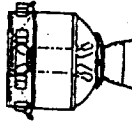

N91-28201

CURRENT SYSTEMS

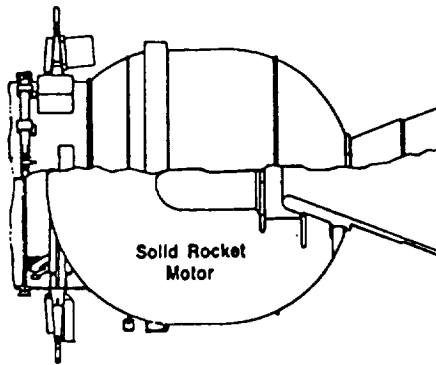
UPPER STAGES

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NASA
OFFICE OF SPACE FLIGHT
JUNE 26, 1990

UNITED STATES ORBITAL TRANSFER VEHICLES

CHARACTERISTICS			PAM-D	PAM-DII	TOS	IUS
STAGE:	MANUFACTURER		MDAC	MDAC	MMC	BAC
	LENGTH (FT)		6.75	6.5	10.0	16.4
	DIAMETER (FT)		4.0	5.3	11.3	9.5
ENGINE:	MANUFACTURER		THIOKOL (STAR 48)	THIOKOL	CSD	CSD
	TYPE		1	ISTP	SRM-1	SRM-1
	NUMBER		SOLID	SOLID	SOLID	SOLID
	FUEL		TP-H-3340	-	HTPB	HTPB
	COMPOSITION					
TOTAL THRUST	(LB)		14,500	17,600	45,000	45,000
SPECIFIC IMPULSE	(SEC)		205.6	-	294	18,250
BURN TIME	(SEC)		85.0	121	150	292.9
						153.0
						104.8
STAGE:	PAD WEIGHT	(LB)	4,616	7,690	23,700	32,537
	IMPULSE PROPELLANT WEIGHT	(LB)	4,400	7,150	21,400	21,403
	BURNOUT WEIGHT	(LB)	418	540	2,390	1,050
	AIRBORNE SUPPORT EQUIP. WT	(LB)	2,505	3,525	3,200	2,553
PAYLOAD:	TO GEO ONE-WAY STAGE	(LB)	1,400	2,100	6,600	5,090
	TO GEO TRANSFER ORBIT (GTO)	(LB)	2,750	4,160	13,000	-17,000
ILLUSTRATION:						
SCHEDULE:	START DATE		1976	1980	1983	1978
	OPERATIONAL DATE		1982	1985	1986	1982
TYPE OF DEVELOPMENT			COMMERCIAL	COMMERCIAL	COMMERCIAL	U.S. GOV'T
SPONSOR			MDAC	MDAC	OSC	USAF

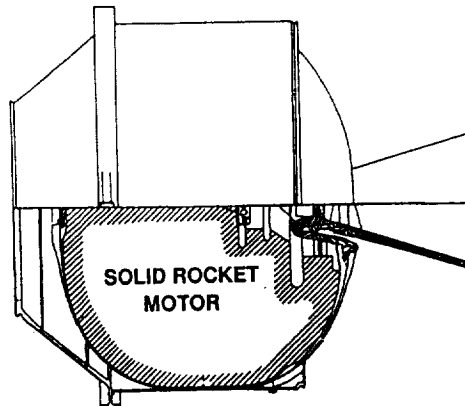
PAM-D



- COMPATIBILITY: DELTA II AND SPACE SHUTTLE
- PERFORMANCE CAPABILITY: 2,700 POUNDS GEOSYNCH TRANSFER
- FLIGHT RECORD: 95% (40 / 42)
- COST: \$6 to 7 MILLION DOLLARS

* 160 x 19,323 Nmi (296 x 35,786 Km)

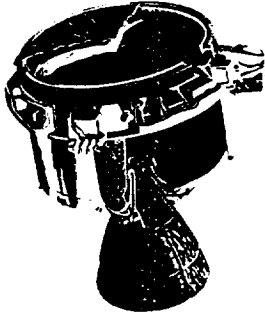
PAM-DII



- COMPATIBILITY: TITAN III AND SPACE SHUTTLE
- PERFORMANCE CAPABILITY: 4,000 POUNDS GEOSYNCH TRANSFER*
- FLIGHT RECORD: 100% (2 / 2)
- COST: \$10 to 12 MILLION DOLLARS

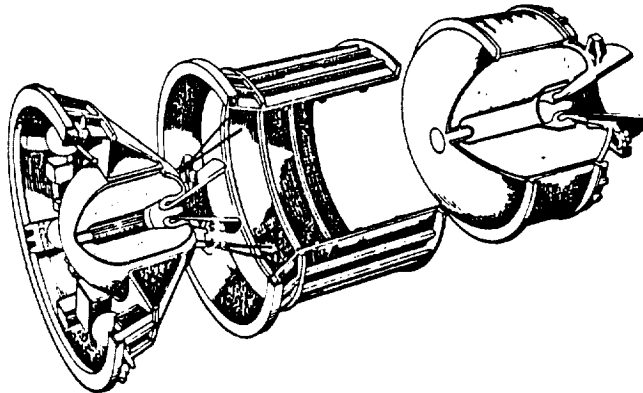
* 160 x 19,323 Nmi (296 x 35,786 Km)

TOS



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|---------------------------|--|
| ● COMPATIBILITY: | TITAN III AND SPACE SHUTTLE |
| ● PERFORMANCE CAPABILITY: | 5,000 to 13,400 POUNDS GEOSYNCH TRANSFER |
| ● FLIGHT RECORD: | |
| ● COST: | \$35 to 45 MILLION DOLLARS |

IUS



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|---------------------------|----------------------------|
| ● COMPATIBILITY: | TITAN IV AND SPACE SHUTTLE |
| ● PERFORMANCE CAPABILITY: | 5,000 POUNDS IN GEOSYNCH |
| ● FLIGHT RECORD: | 86% (6 / 7) |
| ● COST: | \$60 to 70 MILLION DOLLARS |

POTENTIAL NASA UPPER STAGE MISSIONS

- LUNAR OBSERVER - 1996
- MARS OBSERVER FOLLOW-ON - 1996
- ADVANCED TDRS (SERIES OF 9) - 1997

U.S. ORBITAL TRANSFER VEHICLES COST EFFECTIVENESS

